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9. ABSTRACT

This report researches the need for industrial engineering curricula in the Republic of Korea and the nature of the courses needed. It briefly evaluates the status of technical education in Korea, the status of engineering education at Soong Jun University, and Soong Jun's opportunity to meet technical education in Korea today. Included are a suggested industrial engineering program leading to a bachelor's degree, a curriculum study guide applicable to all engineering departments to aid faculty members in revising their respective engineering programs, and a detailed curriculum with course descriptions for an industrial engineering department.

In general, it was found that technical education in Korea presently consists primarily of high-level theoretical programs or of substandard programs with too little emphasis on laboratory training. Curricula need to be revised to provide a more reasonable balance between theory and applied technology. In the field of industrial engineering specifically, the number of industrial engineering graduates in Korea presently is too small to meet the needs of the country's growing industrial sector. Consequently, there is a definite need for an applied industrial engineering program such as the one planned at Soong Jun University. (Subsequent to the publication of this report, Soong Jun successfully petitioned the Ministry of Education for permission to establish a Department of Industrial Engineering. The degree program will be initiated in the fall of 1975).

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CURRICULA RESEARCH AND DEVELOPMENT

Soong Jun University
Seoul, Korea
April 21-June 8, 1974

Prepared for the

Agency for International Development

by

Herbert Eller

Georgia Institute of Technology
Atlanta, Georgia 30332
July 1974

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Acknowledgments

A large number of persons at Soong Jun University are providing the leadership and effort necessary to bring about the desired curricula improvement. They include:

Dr. Hahn Been Lee, President

Dr. Yoon Bae Ouh, Director, Integrated Development Center

Dr. Kyung Gap Yang, Dean, Engineering College

Dr. Clarence E. Prince, Associate Dean, Engineering College

Professor Young Sik Kim, Chairman, Chemical Engineering Department

Professor Young Sak Kim, Chairman, Textile Engineering Department

Professor Jae Bok Yoon, Chairman, Mechanical Engineering Department

Professor Kyun Hyun Cha, Chairman, Electronics Engineering Department

Professor Choong Kyu Park, Chairman, Electrical Engineering Department

Professor Chul Hee Lee, Chairman, Computer Science Department

Professor Young-ho Lim, Mechanical Engineering Department

Professor In Suk Choi, Economics Department

Mr. Jang Choon Lee, Assistant Director, Integrated Development Center

These people, as well as others, provided invaluable leadership and cooperation during the author's stay in Korea.

INTRODUCTION

As part of its program of research and guidance to counterpart institutions in developing countries under the auspices of an institutional grant from the U. S. Agency for International Development, the Georgia Institute of Technology sent the author to the Republic of Korea April 21-June 8, 1974. One of his activities was to determine the need for an industrial engineering curriculum at Soong Jun University and to advise the faculty on its development.

Meetings were held with the engineering college faculty, the president and his staff, and individual educators in various departments and areas of activity. The purposes of these discussions were as follows:

(1) To evaluate the status of technical education in Korea by means of conversations with personnel from the Technical Education Panel of the Ministry of Education.

(2) To aid in identifying weaknesses in technical education regarding curricula, textbooks, apparatus, evaluation techniques, and teaching aids.

(3) To assist individual members of the academic staff in identifying sources of information concerning the latest developments in their areas of specialization.

(4) To discuss with administrators the type of technical assistance required to implement technical education improvement projects.

Curricula research activities at Soong Jun University had received impetus from two sources. First, the university president, Dr. Hahn Been Lee, is committed to the idea of making technical education at the university relevant to the real needs of urban and rural industries in Korea. The result has been the creation of an innovative spirit at the institution. In addition, the Korean Ministry of Education had requested a reduction in the number of semester hours required to earn a bachelor's degree from 200 to 146 under its experimental curriculum revision policy.

As a member of the research committee organized by Dr. Kyung-Gap Yang, Dean of the College of Engineering, to develop tentative new and revised degree programs, the author submitted a suggested industrial engineering program which would lead to a bachelor's degree. This proposed curriculum incorporated guidelines provided by Dr. Yang and Dr. Clarence E. Prince, Jr., Associate Dean of

the Engineering College, regarding core courses, humanities, science electives, and engineering electives. It is shown in this report as Exhibit A.

Based upon the suggested industrial engineering program, Dr. Yang, Dr. Prince, and the author prepared an engineering curriculum study guide for the engineering faculty to aid them in revising their respective engineering programs. In addition to a general pattern of course and credit distributions applicable to all engineering departments (Exhibit B), a detailed curriculum for an industrial engineering department, with course descriptions, was provided by the author as a sample (Exhibit C). This model was accepted by the various department heads.

At the time the author's stay at Soong Jun University was concluded, a formal request was being prepared for submission to the Ministry of Education in June for establishment of a degree program in industrial engineering. Notification of approval of new programs by the Ministry is made in December. Therefore, if approval is granted, Soong Jun University will be in a position to admit students to the new industrial engineering program for the fall semester, 1975.

STATUS OF TECHNICAL EDUCATION IN KOREA

In the United States the universities and colleges have enough autonomy that scientific and technical education projects, including new degree programs, can be implemented within a reasonable length of time. Korean educational institutions of higher learning, especially national institutions, have virtually no autonomy regarding the initiation of new programs. Educators must obtain Central Government sanction to enable them to expedite currently desired technical education improvement programs.

The amount of money appropriated to engineering colleges is often not sufficient to build and maintain the plant, equipment, and materials to enable the students to do the practical laboratory work that is needed in a course in applied engineering. Educators are often required to contend with rigid administrative procedures and policies which impede rapid changes in engineering education improvement programs. Laboratory training could be improved. The educators often think in terms of imported equipment only. There is often a lack of knowledge regarding the availability of desired items of laboratory equipment and materials indigenous to Korea.

Korean engineering professors tend to think in terms of highly sophisticated equipment and materials when designing laboratory experiments. Laboratory work often consists of observation rather than participation by the students in charting data and analyzing results. At some universities, however, engineering courses are being revised to provide a more reasonable balance between theory and applied technology.

STATUS OF ENGINEERING EDUCATION AT SOONG JUN UNIVERSITY

Physical Plant. The physical facilities of Soong Jun University are adequate, with few exceptions. As with most engineering departments, more equipment is desired, but good use is being made of the laboratory equipment now in place. The laboratories are very neat and the equipment is well maintained. Laboratory problems are designed to provide "hands-on" experience for the students.

Textbooks are available in Korean, Asian, and/or other editions. It is customary for students to purchase textbooks for each subject scheduled. Library facilities are available. However, there is a shortage of up-to-date reference books, handbooks, journals, and other related publications.

Research work is limited. The laboratories, in general, are not adequately equipped for sophisticated research. However, the university does not have doctorate programs, which usually require elaborate apparatus for research activities.

Curriculum. Bachelor of Engineering degrees are offered in electrical, electronics, chemical, mechanical, and textile engineering. An industrial education program has been approved. A formal request is being prepared to be submitted to the Ministry of Education for a degree program in industrial engineering. The quota of new students that can be admitted each year is fixed by the Ministry of Education.

Entrance Requirements. To qualify for entrance to the university, students must have graduated from high school, pass the national college entrance examination, and pass an entrance examination administered by Soong Jun University. Final selection is made on the basis of competitive entrance examinations and a personal interview.

Faculty. A number of the faculty members have either a master's degree or Ph.D. in their respective teaching fields. A number of them have received their training in universities in the United States and Seoul National University. Efforts are being made to involve more faculty members in industrial activities for the purpose of gaining practical experience.

SOONG JUN UNIVERSITY'S OPPORTUNITY TO MEET TECHNICAL EDUCATION NEEDS IN KOREA TODAY

It is a fact recognized by officials of the Korean Government who are concerned with technical education, by governmental employers of engineering graduates, by private employers, and by outside observers that Korea needs a large number of engineers and technologists of the type that should be trained in applied programs. However, technical education presently consists primarily of high-level theoretical programs or of substandard programs with too little emphasis on laboratory training. The training now being given often does not equip the students to assume their proper role in meaningful employment after receiving their degree or diploma. Therefore, economic inputs into improving technical education could yield positive returns to the Korean economy.

It is believed that Soong Jun University could provide an extremely useful service to the Seoul community by making selected programs available during the evening to persons who are working but would like to further their education and training. Technician training programs as well as degree programs should be considered. These programs could make an initial impact and have a continuing impetus toward improving technical education to help meet Korea's needs for engineers and technicians.

The curricula research activities being performed at Soong Jun University can play an important part in bringing about a reemphasis upon technical education. Since Ministry of Education approval is required for new degree programs, it seems desirable that Soong Jun University work closely with any organization which advises the Ministry of Education on technical education improvement programs. It is felt that an organization comprising responsible Korean educators should make the final decision regarding the priority of technical education improvement programs. Different organizations or committees might be named for various disciplines, i.e., science, engineering, and technology.

Educational improvements at Soong Jun University would provide a standard of excellence that could serve as a guide to many other educational institutions at various levels in future efforts to upgrade their quality of training. Obviously, these institutions also would need a great deal of financial assistance and expert advice; in order to provide this assistance, Soong Jun University would need funding. Since many proposals for technical education programs are

submitted annually for approval, it might be advisable to convene a panel to review and approve worthy projects. Panel members might be selected from various existing organizations, such as societies for technical educators and councils for technical education. The selection of a proposal by such a panel should be tantamount to receiving budget support by the budgeting agency of the central government.

In the field of industrial engineering specifically, the establishment of such a program at Soong Jun University would, through applied training, provide the type of technological graduates needed in Korea's growing industrial sector. The number of industrial engineering graduates in Korea is very small. Thus far, the universities now offering industrial engineering programs have graduated only a few students.

There are a number of problems facing Korea's managers today. Graduate students at the Korean Advanced Institute of Science enumerated and evaluated some of the more urgent problems in a survey conducted by Professor John Frost, invited lecturer. A report of the survey results is reproduced as Exhibit D and summarized as follows:

When asked what problems management will be required to face during the next five to ten years in Korea, the students gave responses which fell into seven subject areas.

(1) Higher wage demands through union pressure
(2) Shortage of management and technical skills
(3) Increased domestic and foreign competition
(4) Shortage of natural resources
(5) Social and political constraints
(6) Ecological restraints -- air and water pollution
(7) Financial constraints.

Analysis of these problems serves to reinforce the need for an applied industrial engineering program such as the one planned at Soong Jun University. The study of this discipline emphasizes development of the student's abilities to analyze, design, and implement systems that integrate technical, economic, and social behavior factors in industrial, service, social, and government organizations. Thus, trained industrial engineers can render vital assistance to the country in coping with these problems.

A further need is for increased practical assistance to industry from academe. At Soong Jun, the establishment of the Integrated Development Center has provided the various departments of the university with a technical assistance delivery system potential which should be encouraged, financially supported, and implemented.

Exhibit A

SUGGESTED INDUSTRIAL ENGINEERING PROGRAM

INTRODUCTION

Industrial Engineering provides both a basic engineering foundation and a grounding in the interactions between technology and management. Students in the program are usually interested in obtaining a fundamental engineering background as the basis for professional specialization in activities associated with the field -- work methods and standards, management control systems, management science, organization, planning -- or as a preparation for other endeavors such as management. The study of industrial engineering places emphasis upon developing the students' abilities to analyze, design, and implement systems that integrate technical, economic, and social-behavior factors in industrial, service, social, and governmental organizations.

INDUSTRIAL ENGINEERING COURSE OUTLINE

First Year

	Course Title	Credit Hours
First Semester	Bible	2
	Korean	3
	English	3
	Math	3
	Physical Science	4
	Graphics	2
	M.T. & P.E.	2
		19
Second Semester	Ethics	2
	Korean	3
	English	3
	Math	3
	Physical Science	4
	Engineering Computations	2
	M.T. & P.E.	2
		19

Second Year

	Course Title	Credit Hours
First Semester	Introduction to Industrial Engineering	3
	Math	3
	Engineering Mechanics	2
	Principles of Economics	3
	Humanities Elective	3
	Computer Science	2
	M.T.	1
		17
Second Semester	Work Measurement	3
	Bible	2
	Thermodynamics	2
	Statistics I	3
	Engineering Economy	2
	Humanities Elective	3
	M.T.	1
		16

Third Year

	Course Title	Credit Hours
First Semester	Quality Control	3
	Strength of Materials	2
	Wage and Salary Administration	3
	Engineering Elective	3
	Science Elective	3
	Humanities Elective	3
	M.T.	1
		18
Second Semester	Accounting and Cost Accounting	3
	Bible	2
	Engineering Elective	3
	Manufacturing Processes	3
	Science Elective	3
	Humanities Elective	3
	M.T.	1
		18

Fourth Year

	Course Title	Credit Hours
First Semester	Departmental Elective	3
	Project Planning and Control	3
	Production and Inventory Control	3
	Engineering Elective	3
	Seminar	2
	Humanities Elective	3
	Free Elective	3
		20
Second Semester	Plant Layout and Materials Handling	3
	Industrial Safety	3
	Management Decision Making	3
	Engineering Elective	3
	Seminar	2
	Humanities Elective	3
	Free Elective	3
		20
	Total	146

Note: Core courses are underlined.

Note: An industrial engineering student wishing to minor in another field would use the engineering and science electives to schedule at least 21 credit hours in the other department.

SUGGESTED ENGINEERING ELECTIVES FOR INDUSTRIAL ENGINEERING MAJORS

Finance
Marketing
Human Factors in Engineering
Statistics II
Personnel and Labor Relations
Modern Trends in Management
Synthetic Work Measurement
Dynamics of Machinery
Industrial Machinery
Machine Design
Fluid Mechanics

CORE COURSES

Engineering Economy
Engineering Mechanics
Strength of Materials
Computer Science
Thermodynamics

INDUSTRIAL ENGINEERING COURSES REQUIRED FOR INDUSTRIAL ENGINEERING MINOR

	Class	Lab	Total
Introduction to Industrial Engineering	3	0	3
Work Measurement	2	3	3
Statistical Quality Control	3	0	3
Plant Layout and Materials Handling	2	3	3
Engineering Economy	3	0	3
Management and Decision Making	3	0	3
Project Planning and Control	3	0	3
	19	6	21

Students desiring to double major in Industrial Engineering should satisfy the course content of the Industrial Engineering curriculum.

Exhibit B

ENGINEERING CURRICULUM STUDY GUIDE

ABSTRACT

A general pattern of course and credit distributions for engineering departments has been formulated. It should be possible for each department to fit its requirements into this pattern.

Included is a sample curriculum worked out for an industrial engineering department.

Under this plan, engineering students will not have to decide on a major until the end of the freshman year. With wise planning and guidance, it may be possible in some cases to delay final choice of major or minor until the end of the sophomore year.

Total credits are 140-146. This curriculum would meet Engineering Council for Professional Development requirements in the USA. Slightly more humanities courses are in this curriculum at Soong Jun due to various special needs.

An important feature is the elective freedom offered to the student. He may or may not have a minor, which could be in any University department. Double-degrees would be possible only with 1-2 more semesters, however.

GENERAL COURSE STRUCTURE

Year 1

Bible	2	Ethics	2
Korean	3	Korean	3
English	3	English	3
Math	3	Math	3
Physical Science	4	Physical Science	4
Graphics	2	Engr. Computations	2
P.E./M.T.	2	P.E./M.T.	2
	19 credits		19 credits

Year 2

Dept. Course	3	Dept. Course	3
Math	3	Math Elective	3
Engr. Core	2	Engr. Core	2
Engr. Core	2	Engr. Core	2
Humanities Elective	3	Bible	2
Humanities Elective	3	Humanities Elec.	3
M.T.	1	M.T.	1
	17 credits		16 credits

Year 3

Dept. Course	3	Dept. Course	3
Dept. Course	3	Dept. Course	3
LAB	1	LAB	1
Engr. Core	2	Engr. Core	2
Phys. Sc. Elective	3	Phys. Sc. Elective	3
Engr. Elective	3	Engr. Elective	3
Humanities Elective	3	Bible	2
M.T.	1	M.T.	1
	19 credits		18 credits

Year 4

Dept. Course	3	Dept. Course	3
Dept. Course	3	Dept. Course	3
LAB	1	LAB	1
Dept. Elective	3	Dept. Elective	3
Engr. Elective	3	Engr. Elective	3
Free Elective (Optional)	3	Free Elective	3
Humanities Elec.	3	Humanities Elec.	3 (Optional)
	19 credits (16)		19 credits (16)

GENERAL COURSE AND CREDIT DISTRIBUTIONS

Area	Year 1	2	3	4	Subtotal	Total
I. Liberal Arts and Religion:						
a. Bible	2	2	2		6	
b. English 1, 2	6				6	
c. Korean 1, 2	6				6	
d. Ethics	2				2	
e. Math 1, 2	6				6	
f. Humanities Electives		9	3	6	18	
g. P.E./M.T.	4	2	2		8	
						52
II. Free Electives (Any Dept. - Optional):						
a. FE-1				3	3	
b. FE-2				3	3	
						6
III. Required Engineering Sciences:						
a. Physics	4				4	
b. Chemistry	4				4	
c. Phys. Sc. Elective 1			3		3	
d. Phys. Sc. Elective 2			3		3	
e. Math		3			3	
f. Math Elective		3			3	
g. Graphics	2				2	
h. Engr. Computations	2				2	
						24
IV. Engineering Core Courses:						
a. EC-1		2			2	
b. EC-2		2			2	
c. EC-3		2			2	
d. EC-4		2			2	
e. EC-5			2		2	
f. EC-6			2		2	
						12

GENERAL COURSE AND CREDIT DISTRIBUTIONS (continued)

Area	Year 1	2	3	4	Subtotal	Total
V. Required Electives: (Major or Minor Dept.)						
a. RE-1			3		3	
b. RE-2			3		3	
c. RE-3				3	3	
d. RE-4				3	3	
						12
VI. Dept. Required Courses:						
a. D-1		3			3	
b. D-2		3			3	
c. D-3			3		3	
d. D-4			3		3	
e. D-5			3		3	
f. D-6			3		3	
g. D-7				3	3	
h. D-8				3	3	
i. D-9				3	3	
j. D-10				3	3	
k. Lab-Seminar-Independent Study			2	2	4	
						34
VII. Required Departmental Electives:						
a. DE-1				3	3	
b. DE-2				3	3	
						6

Totals

Liberal Arts/Religion	52
Free Electives	6
Required Engineering Sciences	24
Engineering Core	12
Required Electives (major/minor)	12
Department Required	34
Department Electives	6
	146

GENERAL NOTES

I. By the end of the Junior year, a student must have taken:
   a. 6 out of 8 Engineering Core Courses (see list below)
   b. 2 Physical Science Electives
   c. 1 Mathematics Elective

II. Free Electives may be taken in any department or omitted entirely by the student.

III. Required Electives may be taken from any university department.

IV. For a Minor, plan as follows:
   a. Required Electives - 4 for 12 credits
   b. Free Electives - 2 for 6 credits
   c. Department Electives - 1 for 3 credits
   21 credits*

V. A Second Major should be possible in an extra semester or two by satisfying the requirements of the two departments on an individual basis as courses can be scheduled. An Advisor from each department will be needed.

VI. It is suggested that no more than 4 Humanities Electives be taken in any single department. A list of approved Humanities Electives will be prepared.

VII. Each Engineering Department should fit its own curriculum requirements to this general pattern and make recommendations on sequence of courses and suggest engineering core and physical science courses.

A typical course pattern would be developed for each department, but be flexible.

VIII. This curriculum pattern makes possible an Engineering Technology (4-year) option.

The required electives, etc., can be devoted to this. (It would, however, be more demanding than usual due to course overlap with the 4-year engineering students.)

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* The department heads are recommending that non-IE students use these 21 credit hours of engineering electives to obtain a "Minor" in Industrial Engineering.

Exhibit C

THE INDUSTRIAL ENGINEERING DEPARTMENT
(Sample Curriculum)

INTRODUCTION

Industrial Engineering provides both a basic engineering foundation and a grounding in the interactions between technology and management. Students in the program are usually interested in obtaining a fundamental engineering background as the basis for professional specialization in activities associated with the field -- work methods and standards, management control systems, management science, organization, planning -- or as a preparation for other endeavors such as management. The study of industrial engineering places emphasis upon developing the students' abilities to analyze, design, and implement systems that integrate technical, economic, and social-behavioral factors in industrial, service, social, and governmental organizations.

INDUSTRIAL ENGINEERING DEPARTMENT
(140-146 Credits)

Year 1

Course	Credits	Course	Credits
Bible	2	Ethics	2
Korean	3	Korean	3
English	3	English	3
Math	3	Math	3
Physics	4	Chemistry	4
Graphics	2	Engr. Computations	2
P.E./M.T.	1	P.E./M.T.	1
	19		19

Year 2

(D-1)	Introduction to I.E.	3	(D-2)	Work Measurement	3
	Math	3	(Math E.)	Statistics I	3
(EC-1)	Dynamics	2	(EC-3)	Thermodynamics	2
(EC-2)	Computer Science	2	(EC-4)	Engr. Economics	2
(H.E.)	Principles of Economics	3		H.E.	3
	H.E.	3		Bible	2
	M.T.	1		M.T.	1
		17			16

Year 3

(D-3)	Quality Control	3	(D-5)	Accounting & Costs	3
(D-4)	Wage/Salary Admin.	3	(D-6)	Manufacturing Processes	3
(EC-5)	Strength of Mat'ls.	2	(EC-6)	Electric Circuits	2
(ES-)	Phys. Sc. Elec.	3	(ES-)	Phys. Sc. Elec.	3
(RE-1)	Engr. Elec.	3	(RE-2)	Engr. Elec.	3
	H.E.	3		Bible	2
	M.T.	1		M.T.	1
		18			17

INDUSTRIAL ENGINEERING DEPARTMENT (continued)

Year 4

Course		Credits	Course		Credits
(D-7)	Project Planning/ Control	3	(D-9)	Plant Layout-Mat'ls. Handling	3
(D-8)	Production/Inventory Control	3	(D-10)	Management Decision Making	3
(DE-1)	Dept. Elec.	3	(DE-2)	Dept. Elec.	3
(RE-3)	Engr. Elec.	3	(RE-4)	Engr. Elec.	3
	Free Elec.	3		Free Elec.	3
LAB	Seminar	2	LAB	Seminar	2
	H.E.	3		H.E.	3
		20 (17)			20 (17)

NOTES

I. Suggested Engineering Electives for I.E. Majors (not in priority):

a. Finance

b. Marketing

c. Human Factors in Engineering

d. Statistics II

e. Personnel and Labor Relations

f. Modern Trends in Management

g. Synthetic Work Measurement

h. Dynamics of Machinery

i. Industrial Machinery

j. Machine Design

k. Fluid Mechanics

l. Industrial Safety

II. Suggested Engineering Core Courses:

a. Engineering Economics

b. Engineering Mechanics (Dynamics)

c. Strength of Materials

d. Computer Science

e. Thermodynamics

f. Electric Circuits

III. An I.E. student wishing to minor in another field would use the engineering, free, and other electives to schedule at least 21 hours in the other department.

IV. Industrial Engineering courses required for an I.E. Minor:

	Class	Lab	Total
Introduction to I.E.	3	0	3
Work Measurement	3	3	3
Statistical Quality Control	3	0	3
Plant Layout/Materials Handling	3	3	3
Engineering Economics	3	0	3
Management and Decision Making	3	0	3
Project Planning/Control	3	0	3
	21	6	21 credits

V. Students desiring to double major in I.E. should satisfy the course content of the I.E. curriculum.

INDUSTRIAL ENGINEERING

A LIST OF COURSE TITLES AND SUGGESTED TEXTBOOKS
(Equivalent substitutes should be chosen if suggested text is not available)

Subject	Titles
ACCOUNTING AND COST ACCOUNTING	Grant and Bell, Basic Accounting and Cost Accounting
AN INTRODUCTION TO INDUSTRIAL ENGINEERING TECHNOLOGY	Richard C. Vaughn, Introduction to Industrial Engineering (Iowa State University Press)
BUSINESS LAW	Lusk, Business Law, Principles and Cases, Irwin
DATA PROCESSING	Donald H. Sanders, Computers in Business, An Introduction (McGraw-Hill)
ENGINEERING PSYCHOLOGY	McCormick, Human Factors Engineering, 3rd Edition
FINANCE	Weston and Brigham, Essentials of Managerial Finance, Holt, Rinehart, and Winston
INDUSTRIAL SAFETY	Simonds and Grimaldi, Safety Management, (Richard D. Irwin, Inc.)
MANAGEMENT DECISION MAKING	Thieraut, Decision Making Through Operations Research
MARKETING	McCarthy, Basic Marketing: A Managerial Approach (irwin)
MODERN TRENDS IN MANAGEMENT	Cleland and King; Systems, Organizations, Analysis, Management: A Book of Readings, McGraw-Hill, 1969
MOTION AND TIME STUDY	Niebel, Motion and Time Study
PERSONNEL AND LABOR RELATIONS	Strauss and Savies, Personnel, The Human Problems of Management
PLANT LAYOUT AND MATERIAL HANDLING	James M. Apple, Plant Layout and Materials Handling, (Ronald Press)

	James M. Apple, Lab Manual for Plant Layout, (Ronald Press)
PRINCIPLES OF ECONOMICS	Hailstone and Brennan, Economics
PRINCIPLES OF ENGINEERING ECONOMY	Grant, E. L., and W. Grant Ireson: Principles of Engineering Economy
PRINCIPLES OF MANAGEMENT	Sisk, Henry L., Principles of Management, Southwestern Publishing Company, 1969
PRINCIPLES OF PSYCHOLOGY	Sartain: Psychology: Understanding Human Behavior
PRODUCTION AND INVENTORY CONTROL	William Voris, Production Control, 3rd Edition
	Hughes and Grawoig, Linear Programming, Vol. No. 1
PROJECT PLANNING AND CONTROL	Joseph J. Moder and Cecil R. Phillips: Project Management with CPM and PERT. VNR, 1970
SMALL BUSINESS MANAGEMENT	Broom and Longenecker, Small Business Management, Southwestern, 1966
STATISTICAL QUALITY CONTROL	Juran and Gryna, Quality Planning and Analysis
STATISTICS	Hays and Winkler, Statistics, Vol. I., 1970
STATISTICS	William L. Hays and Robert L. Winkler: Statistics Volume II. HRW, 1970
WAGE AND SALARY ADMINISTRATION	Patton, Littlefield, and Self: Job Evaluation
WORK MEASUREMENT	Karger and Bayha, Engineered Work Measurement

TOPIC OUTLINES

Topic outlines are provided for reference for the following courses:

1. Principles of Psychology
2. Principles of Management
3. An Introduction to Industrial Engineering Technology
4. Motion and Time Study
5. Accounting and Cost Accounting
6. Data Processing
7. Finance
8. Marketing
9. Engineering Psychology (Human Factors Engineering)
10. Wage and Salary Administration
11. Statistics I
12. Personnel and Labor Relations
13. Production and Inventory Control
14. Statistical Quality Control
15. Business Law
16. Project Planning and Control
17. Modern Trends in Management
18. Principles of Engineering Economy
19. Statistics II
20. Plant Layout and Material Handling
21. Small Business Management
22. Management Decision Making
23. Industrial Safety
24. Work Measurement
25. Principles of Economics

In cases where the recommended text is not available, the topic outline should be helpful in selecting a substitute text.

Psych. Principles of Psychology

Text: Sartain: Psychology: Understanding Human Behavior

Objectives: By developing personality theories, the psycho-physiological system, theories of perception and learning, and the social and cultural factors which help to determine the above, the student should be prepared to use this knowledge in areas of human relations, child rearing, and Industrial applications such as psychological testing.

Psychology **Principles of Psychology**

TOPIC

Introduction to Psychology
Psychology and the other Sciences
Introduction to Personality Theories
Type Theories
Learning Theory
Holistic Approach
First Quiz
Psychoanalytic Theory
Psycho-Sexual Development
Oral Character
Anal Character
Phallic Character
The Mental Structure
Id and Ego
Super-Ego and Ego Ideal
Personal Defense
Reaction Formation
Neurotic Reactions
Psychotic Reactions
Second Quiz
Motication
Subjective Needs and Drives
Objective Incantives
Theories of Motivation
Emotions
Attitudes, Beliefs, and Prejudice
Ideology and Propaganda
Personality and Society
Personality and Culture
Cultural Differences
The American Personality
Third Quiz
Heredity
Chromosomal Errors
Mutations
Genetic Models
Dominance and Recessive Traits
The Environment
Physiological Factors and Behavior
The Central Nervous System
The Glandular System
The Senses
Vision and Cutaneous
Other Senses
Perception
Conditioning
Association
Personality Tests
Aptitude Tests
Last Test

IM Principles of Management

Text: Principles of Management, Henry L. Sisk, Southwestern Publishing Company, 1969.

An introduction to the principles of organization for non-industrial engineering technology students. The basic factors involved in the organization and operation of a business enterprize are studied.

SUBJECT UNDER DISCUSSION

Introduction
Case Usage
Management Defined
Development of Management Concepts
Objectives and Ethics

Planning
Planning for Profit
Planning for Sales
Planning for Production
Management Information Systems
Decision Making

Organization Theory
Organization Structure
Organization Relationships
Organizational Processes
Committees
Organizational Analysis

Leadership Patterns
Communications
Motivation
The Supervisor
Personnel Planning and Policies
The Basis of Control
Budgetary Control
Nonbudgetary Control
Comprehensive Case Example
Conclusion and Review of the Course

SUBJECT

IE An Introduction to Industrial Engineering Technology

A study of the relationships of the industrial engineering technician with the profit-making enterprise. Emphasis is placed on organizational principles, the functions of the major departments of an enterprise, and practices in manufacturing processes and production methods.

OBJECTIVE

To acquaint the student with the field of Industrial Engineering Technology and its relationship with the profit-making enterprise and the field of Industrial Engineering.

TEXT

Richard C. Vaughn, Introduction to Industrial Engineering (Iowa State University Press

IET An Introduction to Industrial Engineering Technology (5-0-5)

SUBJECT UNDER DISCUSSION

Introduction
The Engineering Technician
Curriculum Orientation
Founders of Industrial Engineering
Forms of Business Enterprise
Industrial Organization
The Role of the I.E. Technician
Plant Location
Manufacturing Engineering
Plant Layout
Material Handling
Packaging
Law
Accounting
Value Engineering
Engineering Economy
Statistics
Properties of Data
The Normal Curve
Probability
Statistical Quality Control
Production Control
Project Control
Purchasing
Inventory Control
Job Evaluation
Motion Study
Time Study
Industrial Relations
Sales Engineering
The IET and Industry
Job Opportunities
IET Student Development
Review

SUBJECT

IE Motion and Time Study

An introduction to the field of Motion and Time Study. The preparation and use of process charts. Micromotion study and the principles of motion economy are studied. MTM-2 is covered as a means of synthetic time study and as a tool for methods improvement. Time study is covered in sufficient detail to allow the student to become productive in this area with minimum training from his employer.

OBJECTIVES

To acquaint the students with the mechanics of motion and time study.
To give an understanding of the human relations problems involved.

TEXT

Niebel, Motion and Time study.

IET Motion and Time Study

TEXT:

Niebel, Motion and Time Study	(A)	required
Barnes, Motion and Time Study	(B)	reserve
IE Handbook	(C)	reserve
Krick, Methods Engineering	(D)	reserve

TOPIC

Introduction
Definition
Process Charts
Operation Analysis
LH-RH Charts
Man-machine Charts
Multiple Activity
Term Project Explanation
Therbligs-Motion Study
Therblig Application
Motion Economy
Micromotion Study
And in Return
Time Study
Rating
Allowances
Making a Time Study
Standard Time
Introduction to MTM
Term Project Work Time
Work Sampling
Turn In Term Project

IET

Laboratory Schedule

Week	TOPIC
1	Process Charts
2	LH-RH Charts Multiple Activity Charts
3	Man-Machine Charts
4	Therblig Application-Micromotion
5	Time Study-Rating
6	Time Study-Data Collection
7	MTM Lab
8	Work Sampling
9	Final Report

SUBJECT

I.M. Accounting and Cost Accounting

Basic concepts of accounting, including problems concerning: expense and income accounts; accounting periods adjustments regarding periodic costing of goods, handling of promissory notes and accruals, deferred charges and credits including the cognizance of handling each of the prementioned charges and credits: the basic understanding of financial statements (actual exhibits), cost accounting including the following: (a) basic objectives; (b) job order costing; process order costing; IME's; and the using of Lifo, Fifo and average costing with problems using the aforementioned.

OBJECTIVES

To bring a non-accounting major to a working knowledge, in a bried period of time, to the working principles of the handling of basic concepts, in the field, with the ability to adapt to the workings of all major acceptions for understanding and principles of the given material in any time Industrial Industry.

TEXT

Grant and Bell, Basic Accounting and Cost Accounting.

COURSE OUTLINE

BASIC ACCOUNTING AND COST ACCOUNTING

IET

1. Introduction: Definitions and Reasons for Subject Matter
2. Basic Concepts: Balance Sheet Viewpoints, owner's equity
3. Basic Concepts: Balance Sheet Viewpoints, Corporation Foundation
4. Limitations of Accounting Valuations--asset valuations
5. Debits and Credits--including illustrations
6. Accounting Terminology--Accural Accounting, Changes in ownership
7. Asset and Expense--timing aspect
8. Trial Balance and determining profit or loss for accounting period
9. Expense and Income Accounts--perpetual inventory
10. Expense and Income Accounts--Cost of goods
11. Closing of the books for an Accounting Period: Problem 3-1
12. Problems 3-5, 3-6, individual student assistance
13. Introduction of end of period adjustments
14. Extension of end of period adjustments, periodic inventory--cost of goods
15. Extension of end of period adjustments accrued aspect--sales returns and allowances
16. Extension of end of period adjustments ten-column worksheet illustration
17. Deferred charges and credits
18. Bad debts and sales discounts, depreciation
19. Problems 7-1, 7-2
20. Problem 7-3
21. Review of Quiz
22. Study of Financial Statement-Actual company reports

BASIC ACCOUNTING AND COST ACCOUNTING

23. Study of Financial Statement--Actual company reports, par and no par stock; use of ratios and comparisons

24. Study of Financial Statement--Actual company reports, conservatism and disclosure; consistency in reporting

25. Objectives of Cost Accounting--Basic principles

26. Objectives of Cost Accounting--cost control-effects and methods

27. Cost Accounting--conflicts between objectives; distinction between selling and using manufacturers costs

28. Cost Accounting--methods of applying burden for IME's; inventory accounts

29. Job Order Costing--techniques and illustrations

30. Job Order Costing--techniques and illustrations

31. Problem 10-4 Review for quiz

32. Theory section of material on Chapters 8-9-10

33. Problem section of material on Job Order

34. Review of Quiz

35. Process costing introduction--distinction between job order and process cost

36. Illustration of Process Costing

37. Illustration of Process Costing

38. Disposition of overhead variance--departmental use

39. Treatment in cost accounting of partly completed work units

40. Material costs--Average cost; Lifo, Fifo-advantages and disadvantages

41. Material costs--Illustrations using various methods

42. Standard costs--unit variation analysis

43. Review for Final

44. Final Examination

SUBJECT

IE DATA PROCESSING

The study of industrial data processing methods. Emphasis is placed on equipment used, equipment selection, and the development of preferred methods of data processing.

OBJECTIVE

To give the student a survey of punched card and electronic data processing equipment and methods, with emphasis on the systems approach to developing methods, the factors that influence the selection of methods and equipment and the problems associated with the installation of new methods and equipment.

TEXT

Donald H. Sanders, Computers in Business, An introduction (McGraw-Hill)

IET DATA PROCESSING

TEXT: Computers in Business, Donald H. Sanders

The following books are on reserve in the library;
(LA) Data Communication in Business, Edgar C. Gentle
(LB) Electronic Data Processing, An Introduction, W. W. Martin, Jr.
(LC) Business Information Processing Systems, Elliott and Wasley

Introduction and Information
Data Processing and Evolution

Information Revolution
Introduction to Computers

Input/Output Media and Devices
Input/Output Media and Devices

Data Transmission
Central Processing Unit
Numbering Systems

Storage Devices
Multi-machine Configurations

Programming Analysis
Flow Charts
Program Preparation

Computer Languages
Program Coding
Program Controls

Management and Computers
Systems Study

Organization
Staffing and Control
Tomorrow's Outlook

Records Retention Studies
Vital Records Studies

SUBJECT

IM Finance

A study of the finance function of the firm, with attention directed to the corporate tax environment, financial planning of the firm, and capital budgeting. Also included in the study will be the long investment decisions of the enterprise, and how the concept of present worth and internal rate of return will influence financial decisions. A thorough treatment of the financial structure of the firm and the use of leverage as related to the cost of capital will serve to demonstrate to the student how the concept of debt can be used to increase the value of the firm. Working capital management and the various forms of long term financing, such as common and preferred stock, will also be discussed.

OBJECTIVES

It is a survey of the whole field of finance, both private and public. Emphasis is placed on current problems in the field as well as on basic principles developed from past experiences.

TEXT

Weston and Brigham, Essentials of Mangerial Finance, Holt, Rinehart, and Winston

IM Finance

TOPICS

The Finance Function
Role of Financial Decisions
Tax and Expenditure Patterns
Corporate Income Taxes
Personal Income Taxes
Types of Financial Ratios
Break-Even Analysis
Source and Use of Funds
Budgeting
Cash Budgeting
Quiz
Compound Value
Present Value
Appropriate Interest Rate
Choosing Among Alternative Proposals
Ranking Investment Proposals
Theory of Financial Leverage
Factors Influencing Financial Structure
Capitalization of Income
Definitions of Value
Debt Capital
Preferred Stock
Cost of Equity
Marginal Cost of Capital
Quiz
Working Capital Management
Security Markets
Nature of Investment Banking
Common Stock Financing
Nature of Preferred Stock
Convertible Preferred Stock
Quiz

SUBJECT

IM' Marketing

This course ia an introduction to the individual and the business firm as customers; their needs, and methods of arriving at needs, satisfying decisions, and an introduction to the marketing function, also its organization, decision areas, and control techniques.

OBJECTIVES

The student should become acquainted with the organization of the marketing function, the tasks it performs, the decisions it makes, and the psychological and organizational nature of the customer and methods of stimulating and satisfying customer needs.

TEXT

McCarthy, Basic Marketing: A Managerial Approach (Irwin)

IM Marketing

TOPICS

The Marketing System
The Management Job in Marketing
Legal Environment of Marketing
Marketing Research
Developing Industry Sales Forecasts
Forecasting Sales for Established Products
Consumer Spending Patterns
Consumer Behavior is Multidimensional
Consumers--The International Market
Consumers--A Behavioral Science View
Methods of Industrial Buying
The Farm Market
The Government Market
Product Situations
What is Packaging?
The Development of Branding
Conditions Favorable to Branding
Consumer Goods
Industrial Goods
Product Planning
Product Life Cycles
Style and Fashion Cycles
Channels of Distribution
The Transporting Function
The Storing Function
Basic Promotion Methods
Typical Promotion Blends
Price and Price Objectives

SUBJECT

IE Engineering Psychology (Human Factors Engineering)

An Introduction to Human Factors Engineering covering man's physical (mechanical) operation, as well as the best way to design man-machine systems to take advantage of man's capabilities and limitations. This includes the study of seating, controls, displays, and industrial applications of human factors data.

OBJECTIVE

To enhance the effectiveness of the use of the physical objects and facilities people use and to maintain or enhance certain desirable human values in the process.

TEXT

McCormick, Human Factors Engineering, 3rd Edition

IET Engineering Psychology

TOPIC

Introduction
Man Machine Systems
Human Sensory Processes
Information Input
Information Mediation
Methods of Investigation
Arrangement of Space
Anthropometry
Work Capacity of Females
Environmental Factors
Physiological Measures
Heat Stress
Displays
Controls
Review

SUBJECT

IE Wage and Salary Administration

An Introduction to Wage and Salary. Subject matter emphasized includes principles and policies, job evaluation, pricing jobs, methods of wage payment and special compensation devices.

OBJECTIVES

To enable the student to acquire a general knowledge of compensation theory and compensation practice. To develop proficiency in analysis and evaluation of wages and salary compensation, theory, and practices insofar as they relate to individual employees, unions, employing organizations, governments - in fact, our entire economy.

TEXT

Patton, Littlefield, and Self: Job Evaluation

IE Wage and Salary Administration

TOPIC

Introduction
Purpose of Evaluation
Planning a Program
Union Relations
Job Analysis
Job Description
Ranking
Factor Comparison
Point Rating
Executive Position
Selection of a Method
Evaluation Process
Catch-Up Day
Surveys
Wage Curves
Committees
Administration
Coordination (Projects Due)
Coordination
Review and Catch-up

SUBJECT

IE Statistics I
Prerequisites: Analytic Geometry and Calculus, Computer Programming

An introduction to descriptive and inductive statistics with emphasis placed on inductive statistics. Frequency distributions, measures of location and variation, probability, estimation, and tests of hypothesis are covered.

OBJECTIVES

To introduce the student to the fundamentals of statistics, particularly basic inductive and deductive techniques, and the basic tools of statistical analysis.

TEXT

Hays and Winkler, Statistics, Vol. I., HRW, 1970

IET . Statistics I

TEXT: Hays and Winkler, Statistics, Vol. 1, HRW, 1970.

TOPIC

Sets and Functions
Probability Theory

Probability Distributions
Special Distributions

Freq. and Sampling Distri.

Estimation

Hypothesis Testing

Bayesian Inference

SUBJECT: IM - Personnel and Labor Relations

OBJECTIVES:

To suggest to the student systematic and scientific approaches to management in areas of personnel and labor relations.

TEXT:

Personnel, The Human Problems of Management, Strauss and Savles

IMT **Personnel and Labor Relations**

SUBJECT

Collective Bargaining in America
The Organized Labor Movement
Negotiating the Labor Agreement
Technology and Job Satisfaction
Motivating People to Work
The Exercise of Authority
Developing Group Participation
Why Communications Break Down
Overcoming Barriers to Communication
Types of Discipline
The Role of the Union in Discipline
Specialization and Job Satisfaction

The Internal Organization of the Union
The Organization of Credit Unions
The Organization of Industrial Unions
Specialization and Job Satisfaction
Basic Patterns of Lateral Relations
Organizational Implications of Increased Specialization
Specialization and the Foreman's Role
Building Integrated Work Teams
Improving Coordination Between Groups
The Meaning of Decentralization
Personality and Organization Structure
Power Levels of Supervision

Aspects of Wage and Salary Administration
Job Evaluation
The Point System
Wage and Salary Policy Problems
Merit Rating
The Impact of Incentive Systems
Auxiliary Incentive Plans
The Future for Incentives
Group Piece-work
Profit-Sharing
Suggestion Systems
The Scanion Plan
The Contemporary Scene: How Much Human Relations?

SUBJECT

IE Production and Inventory Control

The traditional functions and responsibility of production control are covered during the first part of the course. A review of matrix algebra is covered in order to give the student a background for Linear Programming. Twelve class periods are used to introduce the student to the Simplex technique of Linear Programming. The basic concepts of Inventory Control are presented.

The class is assigned the problem of designing a production control system for an actual plant to determine the problems that exist. The students then design a production control system to fit the conditions of that plant. When such a problem is available it is used in lieu of Linear Programming. During the past quarter, Fall, 1972, a production control system was designed for Marvend, Inc., Marietta Georgia.

OBJECTIVES

The student becomes acquainted with the functions and techniques of production control. The student is introdueed to Linear Programming and the basic models of Inventory Control.

TEXT

A. William Voris, Production Control, 3rd Edition

B. Hughes and Grawoig, Linear Programming, Vol. No. 1

IET Production and Inventory Control

TEXT: (A) Voris, William: Production Control, 3rd Edition
(B) Hughes and Grawoig: Linear Programming, Vol. No. 1

TOPIC

Introduction to Production Control
Objectives and Applications
Functions of Management
Control Functions
Forecasts
Intermittent Manufacturing
Scheduling

Continuous Manufacturing
Matrix Algebra
Linear Programming
Graphical Approach
Simplex Algorithm
The Initial Tableau
Pivoting the Tableau
Interpreting the Tableau
The Final Tableau
Exercises
Economic Order Quantity
Quality Discounts
The Re-Order Problem

SUBJECT

IE Statistical Quality Control

An introduction to statistical quality control covering control charts for attributes, acceptance sampling, and development of these tools.

OBJECTIVE

To introduce the student to the techniques of SOC while stressing the statistical development of these techniques and their applications in Industry.

TEXT

Juran and Gryna, Quality Planning and Analysis

IET Quality Control

TEXT: Juran and Gryna, Quality Management and Analysis (A)
Aft, Notes on reserve in the library

TOPIC

Introduction
Acceptance Sampling
Single Sampling
OC Curves
Double Sampling
AOQ
ASN
ATI
Review
Problems Due

Frequency Distributions
Graphical Representation
Parameters
Normal Distribution
Chi Square
Problems

Limits and Tolerances
Control Charts for
Averages and Ranges
Variation
Control limits and tolerances
Other Control Charts
Problems

"Quality Management"
Review

SUBJECT

IM Business Law

Topics covered consist of Torts and Criminal Law, Contracts, Estates and Bankruptcy, Agency and Employment. Other topics covered at the election of the professor are Insurance, Commercial Paper, Personal Property and Bailments, Sales, Security Devices, Partnerships, Corporations, and Real Property.

OBJECTIVES

Business Law presents a carefully documented presentation of the legal framework of business for beginning students with special meaning for engineers, managers, and citizens. To attain this objective emphasis is placed upon the purpose and logic of the law as well as principles and rules. The student is given the opportunity to analyze factual case problems to apply general principles of law, with special emphasis upon cases dealing with problems related to engineering and industry.

TEXT

Lusk, Business Law, Principles and Cases, Irwin

IM Business Law

TOPIC

The Development of Law in America
Enforcement of the Law
Criminal Law
Torts
Nature of Contracts
Nature and Forms of Offer
Requirements for Acceptance
Misrepresentation and Fraud
Consideration
Capacity of Parties
Illegality
Statue of Frauds
Rights of Third Parties
Performance and Remedies
Introduction to Agency
Relation of Principal and Third Person
Relation of Agent to Third Person
Relation of Principal to Agent
Creation of Partnership
Relation of Partners between Themselves
Relation of Partners to Third Persons
Definition and Effect of Dissolution
Introduction to Commercial Paper
Requirements for Negotiability
Negotiation and Holder in Due Cause
Liability of Parties and Discharge
Checks and Documents of Title

SUBJECT

IE [illegible] Project Planning and Control
Prerequisites: IE 227, Computer Programming

The use of critical path methods in planning, scheduling, and control of projects is introduced. The concepts of both Critical Path Method and Program Evaluation and Review Technique (CPM and PERT) will be presented.

OBJECTIVES

To acquaint the student with current techniques in project management particularly, CPM, PERT, SIS, AND GERT. Some reference to other scheduling techniques is also made, e.g., Gantt charts. The use of EDP equipment is a part of the course.

TEXT

Joseph J. Moder and Cecil R. Phillips: Project Management with CPM and PERT. VNR, 1970.

IET Project Planning and Control (3-0-3)
Prerequisites: IET 227, Math 215

TOPICS

Introduction
Networks
Networks and Time Estimation
Scheduling Techniques, Arrow
Scheduling Techniques, Precedence
Computers and CPM
Short Interval Scheduling
Resource Allocation
Time-Cost Trade-Off

Cost Controls
PERT
GERT
TBA
Projects Due

SUBJECT

IM Modern Trends in Management
Prerequisites --Fourth Year standing, IMT or IET Major.

The impact of modern technical developments and systems analysis on management. Current thinking in environmental technology management, industrial organization, project and process management.

OBJECTIVE

To give the student the opportunity to become familiar with management concepts and techniques beyond the scope of the standard curriculum. The student group is allowed to help in the organization of the course, in the scheduling and presentations in it, and in the review of what was covered.

TEXT

Cleland and King; Systems, Organizations, Analysis, Management: A Book of Readings, McGraw-Hill, 1969.

IMT -- Modern Trends in Management
Prerequisites: Fourth-year standing, IET or IMT major.

The impact of modern technical developments and systems analysis on management. Current thinking in environmental technology management, industrial organization, project and process management.

SCHEDULE

Since this is a senior elective course, it is taught in a much less rigid format than other required courses. The instructor uses the first two or three weeks to refresh the students on industrial organization and management, and introduces them to some modern concepts. A quiz is used to complete this portion of the course.

During these first few weeks, the instructor allows a portion of each meeting to be used for determination of the rest of the schedule. The students participate in this determination. When the schedule is decided, it is typed and distributed to all students and then the responsible students for each segment of the schedule must carry it out.

The schedule is distributed throughout this document, immediately preceeding the handouts and written reports for each section.

SUBJECT

IE Principles of Engineering Economy
Prerequisites - Computer Programming, a calculus course

Output and Life of Equipment, operation costs, depreciation rates, economic selection of equipment, determination of economic lot sizes, and cost studies on representative problems.

OBJECTIVES

To acquaint the student with methods used to make quantitative decisions between alternatives involving engineering and the time value of money. To teach an appreciation for the costs and benefits of various projects as viewed by different parties. To teach the need for seeking expert advice so that good solutions are not overlooked. To teach the importance of cash flow and of irreducible data.

TEXT:

Grant, E.L., and W. Grant Ireson: Principles of Engineering Economy.

IET Principles of Engineering Economy
Prerequisites: Computer Programming, a calculus course

TEXT: Grant, Principles of Engineering Economy, Fifth Edition.

TOPICS

Introduction, definition of engineering economy
Alternatives
Equivalence, Interest, interest rates and compound interest
Equivalence, present worth, present worth tables
Compound amount computation from principle

Find principle from compound amount
Find uniform series from compound amount
Find compound amount from uniform series
Find uniform series from principle
Find principle from uniform series
Relationship between factors-reciprocals-tables
Nominal and effective interest
Problem solutions using formulas and tables
Interest necessity and possibility
Concealed costs of borrowed money
Minimum attractive rate of return
Annual cost - no salvage
Annual cost - salvage
Annual Cost and variable annual disbursements - perpetual life
Annual Cost - straight line depreciation
Annual Cost - Interest on first cost plus amortization
Annual Cost and advantages of straight line plus average interest
Present worth - effect on salvage value
Present worth - effect on difference in lives
Present worth - capitalized cost
Present worth - perpetuity
Captilaialized Cost - compare methods
Valuation of property-compound amount
Valuation of bonds

SUBJECT

IE Statistics II

A continuation of Statistics I, with all subject matter being built upon the knowledge learned in the first course. Applications of the statistics in the course is emphasized.

OBJECTIVES

To acquaint the student with the tools of statistical analysis, particularly regression and correlation analysis, sampling techniques, experiment design, analysis of variance, and some nonparametric techniques. The course is problem solving, as opposed to theoretical, in its orientation.

TEXT

William L. Hays and Robert L. Winkler: Statistics Volume II. HRW, 1970.

IET Statistics II

TEXT: Hays and Winkler: Statistics, Vol. II, HRW, 1970.

TOPICS

Introduction
Type I and II errors
Power Functions
Two Tail Tests
One Tail Tests
Mean and Sigma Tests
Regression and Correlation
Sampling and Experimental Design
Nonparametric Methods

SUBJECT

IE Plant Layout and Material Handling

A study of the principles of plant layout and material handling, the use of process and flow charts, the use of tools and aids for effective plant layout, the determination of material handling plans, the construction techniques of plant layout, and the cost, presentation, and installation of a plant layout.

OBJECTIVES

To present to the student the procedures and techniques used in planning efficient production facilities by the student actually designing a complete layout for a small plant.

TEXT

James M. Apple, Plant Layout and Materials Handling, (Ronald Press)
James M. Apple, Lab Manual for Plant Layout, (Ronald Press)

IET Plant Layout and Material Handling

TOPIC

Introduction
Operation Process Chart
Production Planning
Production Calculations
Receiving and Shipping
Receiving and Shipping Requirements
Office and Plant Services
Service Area Planning
Planning Material Flow
Organization and Activity Relationship
Planning and Allocating Space
Area Allocation Diagram
Material Handling
Equipment Selection
Material Handling Problem
Operation Planning
Work Area Planning
Accumulation of Cost Data
Material Handling at Work Place
Begin Layout
Making the Plant Layout
Work on Layout
Determination of Operation Costs
Material and Manpower Costs
Determination of Costs
Equipment and Facilities Costs
Determination of Costs
Cost Schedules
Report to Management
Presenting the Layout
Presentation of Student Layouts
Installing the Layout

SUBJECT

IM Small Business Management

Small business in a free enterprise economy, the role of the small business manager or entrepreneur, the factors in failure and success, and the legal and economic problems of small business.

OBJECTIVES

To provide for the student, through study and discussion, an opportunity to analyze and appreciate the environment of the small enterprise, and to prepare for problems in the financial and operating controls in the small business.

TEXT

Broom and Longenecker, Small Business Management, Southwestern, 1966.

IM Small Business Management

TOPIC

Introduction
Small Business
Management Functions
The Entrepreneur, Business Initiation
Planning and Organizing
Retail Stores and Service Firms
Case Analysis
Capital and Credit
Business Records and Reports
Business Risk
Case Analysis
Location and Facilities
Production
Procurement
Machine Usage
Human Relations
Marketing and Sales
Market Research and Credit
Business Law
Legal Aspects and Government
Review and Conclusion

IM Management Decision Making

TEXT: Thierauf, Decision Making Through Operations Research.

OBJECTIVES

The student should acquire a through understanding of the information required to establish quantitative models in the basic decision areas and an acquaintance of the areas of application of quantitative analysis.

IM Management Decision Making

TEXT: Thierauf, Decision Making Through Operations Research.

TOPIC

Introduction
History of Operations Research
Goals of Operations Research
Introduction to Model Building
Types of Models
Operations research in the Firm
Introduction to Probability
Marginal, Joint, and Conditional Probabilities
Statistical Dependence and Independence
Combinations and Permutations
Revision of Prior Probabilities
Decision Trees
Mathematical Expectation
Discrete Distribution and Expected Profit
Continuous Distribution and Expected Profits
Uncertainty and Decisions
Introduction to Mathematical Maximization
Differential Calculus
Demand, Prices, and Profit Maximization
Review of Integral Calculus
Equation of Marginal Earnings and Marginal Cost
Equipment Selection
The LaGrange Multiplier and Maximization
Inventory Control
The Saw-Toothed Model
Algebraic minimization
Differential Minimization
Reorder Point and Safety Stock
Production Run Problems
Introduction to Linear Programming
Graphic Solution
The Simplex Solution
Simplex Maximization
Simplex Minimization
Matrix Explanations
The Transportation Problem
Game Theory
Arithmetic and Algebraic Solutions
Graphic and Dominance Solution
Matrix Solutions
Simplex Solution
Market Analysis
Market Movement and Probabilities
One Period Market Equilibrium
Multi-Market Equilibrium
Long Run Equilibrium

SUBJECT

IE Industrial Safety

The role management must play in industrial safety, the information must have to insure an efficient, well-managed safety program with particular emphasis on fire prevention, industrial hygiene, accident costs, compensation, insurance, and safety organization.

OBJECTIVES

To acquaint the student with the role management must play in the prevention of industrial accidents, with emphasis on new methods of determining and reporting costs of accidents in industry; the value of motivation; the psychological aspects of accident prevention and auxiliary functions of a safety department.

TEXT

Simonds and Grimaida, Safety Management, (Richard D. Irwin, Inc.)

IE Industrial Safety

TOPIC

Introduction
Problems
Objectives
Responsibility
Organization
Costs
Motivation
Accident Sources
Layout and Design
Machinery Guards
Electrical Hazards
Industrial Hygiene
Personal Protective Equipment
Automotive Safety
Training
Psychological Aspects
Fire Prevention
Product Development
Ecology and Safety
Safety Legislation
OSHA
OSHA (Projects Due)

SUBJECT

IE Work Measurement

The use of pre-determined time standards to determine work standards.

OBJECTIVE

To acquaint the student with standard time systems, most noticeably the Methods Time Measurement (MTM)System of pre-determined times. At the completion of the course the student will be able to apply MTM to set standards.

TEXT

Karger and Bayha, Engineered Work Measurement

PROCEDURES AND CREDITS

On the following pages.

The AMET Self-Study Program

The IE Self-Study Program is a new approach designed to replace the conventional lecture-recitation system.

In the conventional approach, the instructor aims the level and pace of the course at the average student. The superior student is apt to be bored. He certainly is not helped in gaining knowledge beyond that designed for the ability of the average student. The slow student is really discriminated against. He finds that he cannot keep up and soon realizes that falling behind usually results in failure in a course such as physical science.

The course will be scheduled for a regular hour. The instructor will be available at this time to assist you individually. Except for the first orientation session, there will be no schedule and no required homework.

The minimum amount of material to be covered is divided into 14 units. These units must be covered in order.

For each unit, you will be given text assignments, problems, and material to assist you in learning the required subject matter. If you run into a snag, the instructor will be available to help you at the regularly scheduled class time and during his office hours.

When you feel that you have mastered the subject matter, you may take a quiz on that unit. The quiz procedure will be as follows:

1. Sign up for the quiz you wish to take at least 15 minuted before class starts. This sign up list will be on your instructor's office door.

2. Your quiz will be graded immediately on a pass/fail basis. Each question is also graded on a pass/fail basis. When problems appear on a test, they are weighted 50% of the total test. Students are urged to stay and watch their papers be graded.

3. If you pass, you may go on to the next unit, and take that test the next day, if you wish.

4. If you fail, it does not count against you. As soon as you feel that you are ready, you may take another quiz over the same material. You may make as many attempts as necessary to pass. The only rule is that if you fail a quiz, you must wait at least one class day before attempting another quiz on that unit.

When you have passed all 14 quizzes, you will have earned a minimum course grade of C. At this point, you may take your C and retire from the course.

If you complete fewer than ten units during the quarter, your course grade will be F. If you complete ten, eleven, twelve, or thirteen units, your grade will be Incomplete. In this case, you may convert this to a grade of C by completing the balance of the 14 units during the next quarter. If the 14 units are not completed within this period, the grade becomes an F.

If you wish to try to raise your grade to a B or an A, you must take additional work. (Extra work must be completed during the regular quarter.)

To earn a B, an MTM film analysis is required, completed to the instructor's satisfaction. To earn an A, an additional project is required, as specified by the instructor.

TOPIC

Introduction
Work Measurement
Reach
Move
Turn
Crank
Apply Pressure
Grasp
Release
Position
Disengage
Eye Motions
Body, Leg, Foot Motions
Motion Combinations

SUBJECT: Econ Principles of Economics

An introduction to the economizing problem related to need satisfaction and resource allocation in a mixed market economy. Both product market and resource market principles and operations are covered at both the micro and macro levels, with a discussion of criteris of optimum resource allocation and income distribution.

OBJECTIVES

The student acquires an understanding of the major economic goals of the individual, firm, and community; the criteria used in determining the best desirable goals, and the effect of varying market conditions on the attainment of these goals. He should also acquire a profiency in stating economic relations in graphical and algebraic models.

TEXT:

Hailstone and Brennan, Economics

SUPPLEMENTARY READINGS:

(a) Wykstra - Introductory Economics - Chapter 11, Monetary Policy
(b) Miernyk - Economics - Chapter 16 - Banking System
(c) Spencer, Contemporary Economics - Chapter 3, Economic Systems

Econ Principles of Economics

TOPIC

Introduction
The Economic System
Scopes and Methods
Work on Projects
Government and Circular Flow
Prices, Supply and Demand
Production, Cost, Profit
Pure Competition
Agriculture, Monopoly
Work on Projects
Oligopoly and Public Policy
Labor Economics
Rent, Interest, Profits
Human Capital
Work on Projects
GNP
Employment and Income
Money
Work on Projects
Banking
Stabilization
Stabilization and Fiscal Policy
Public Budget (Projects Due)
Taxation
Consumers and Businesses

Exhibit D

EVALUATION OF FUTURE MANAGEMENT PROBLEMS IN KOREA

(From a survey conducted by Professor John Frost
at the Korean Advanced Institute of Science)

WHAT PROBLEMS WILL MANAGEMENT BE REQUIRED TO FACE DURING THE NEXT 5-10 YEARS IN KOREA?

(From response to the question by the graduate students in industrial science at the Korean Advanced Institute of Science)

1. Higher Wage Demands through Union Pressure

As it has in all developed countries, and some developing countries, the labor market will change. As industries increase, the need for skills will increase and labor will become competitive. In addition, they will learn, as all labor has learned, that in numbers there is strength and unions will grow stronger. There will also exist a wide generation gap between the workers of today and those of 10 years from now.

All this means higher and higher wages -- more social welfare and reform-- the cost of which must largely be borne by industry.

2. Shortage of Management and Technical Skills

To meet the problems of tomorrow, a highly trained top and middle management force will be required. Costs will have to be reduced even with the increase in the costs of labor and materials, and, at the same time, product quality, reliability, and function will have to be improved in order to obtain consumer acceptance and compete in the world market.

This means that good industrial engineers and technicians must be trained in Korea who know how to solve these problems. Korea must become independent of foreign assistance.

To provide these skills, education and industry must work closely together -- industry must tell education what it needs and provide opportunities for the students to utilize and apply their skills, and education must design its curricula to meet these needs.

3. Increased Domestic and Foreign Competition

Innovation, initiative, and the utilization of special skills will be needed to make products more functional and improve both quality and reliability. Value analysis must be applied at all levels of the manufacturing process from product design to the design of management systems to insure that the right methods are used and to bring all phases of the process under control.

4. Shortage of Natural Resources

Policies must be directed toward the fullest development of natural resources. The riches of the earth and the oceans have scarcely been touched. We must look harder and dig deeper to find them. Existing resources must be developed to their full potential.

5. Social and Political Constraints

At the international level, there will be changes in tariffs and trade barriers to cut off or limit a uniform flow of exports and imports. Worldwide inflation may adversely affect foreign exchange rates.

At the local level, industry must become independent of government subsidy and restrictions. There should be more and more separation of management and ownership. Money invested in stocks provides a greater incentive for industrial growth than compulsory savings.

The successful transition from an agrarian to an industrial economy will require changes in deeply rooted cultures.

The increase in social and welfare requirements must be borne jointly by government and industry.

6. Ecological Restraints -- Air and Water Pollution

In any industrialized economy, the factor of pollution cannot long remain unchecked and uncontrolled.

7. Financial Constraints

The necessary amortization of foreign loans without foreign exchange dollars will increase industry taxes unless a bigger share of the foreign market can be captured. The ratio of foreign investment to domestic investment is too high -- another reason for encouraging public stock ownership in industry.

All of these problems pose difficulties, but they can be solved. Their solution, however, will require a very close working relationship, cooperation, and understanding between industry, education, and government. The students suggest that a governmental agency, composed largely of representatives from industry and education, should be formed to study the long-term needs of industry so that curricula can be best designed to meet these needs.